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U.S. Patent Application Serial No. 09/975,560
Response dated March 9, 2004
Reply to OA of November 10, 2003

IN THE CLAIMS

Please cancel claims 4, 6 and 7 without prejudice or disclaimer. Please amend claims 1, 2, 3, 8 and 11-16, and add new claims 18-20 as follows:

Claim 1 (Currently Amended): A non-aqueous solvent-soluble hologram recording material composition ~~comprising~~ consisting of (A) ~~an allyl-based~~ a diallylphthalate-based prepolymer being soluble in a non-aqueous solvent and having at least one allyl group in a molecule thereof and a molecular weight of 10,000 to 100,000, (B) a (meth)acrylate-based compound having at least one polymerizable unsaturated group in a molecule thereof, and (C) a photo-polymerization initiator, wherein a difference between a refractive index of said allyl-based prepolymer (A) and a refractive index of a polymer of said (meth)acrylate compound (B) is 0.005 or more.

Claim 2 (Currently amended): ~~A hologram recording material composition as claimed in claim 1, wherein said composition further comprises~~ A non-aqueous solvent-soluble hologram recording material composition consisting of (A) a diallylphthalate-based prepolymer being soluble in a non-aqueous solvent and having at least one allyl group in a molecule thereof and a molecular weight of 10,000 to 100,000, (B) a (meth)acrylate-based compound having at least one polymerizable unsaturated group in a molecule thereof, and (C) a photo-polymerization initiator, wherein a difference between a refractive index of said allyl-based prepolymer (A) and a refractive index of a polymer of said (meth)acrylate compound (B) is 0.005 or more, and (D) a solvent-soluble

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thermoplastic resin in a weight ratio to said allyl-based prepolymer (A), (A) : (D) of 80 to 100 : 20 to 0.

Claim 3 (Currently amended): A hologram recording material composition as claimed in claim 1, wherein said ~~allyl-based~~ diallylphthalate-based prepolymer (A) is a homopolymer of an allyl-based monomer having at least two allyl groups in a molecule thereof or a copolymer of said allyl-based monomer and another copolymerizable monomer, the copolymer containing a polymeric unit of said allyl-based monomer in an amount of more than 20% (excluding 20%).

Claim 4 (Canceled):

Claim 5 (Original): A hologram recording material composition as claimed in claim 1, wherein said allyl-based prepolymer (A) is an organic-inorganic complex transparent uniform material obtained by subjecting a metallic alkoxide having a metallic atom, a group having an aromatic ring, and a hydrolyzable group to dehydration condensation by a sol-gel method in the presence of a diallyl phthalate-based monomer and/or a diallyl phthalate-based polymer.

Claim 6 (Canceled):

Claim 7 (Canceled):

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Claim 8 (Currently amended): A hologram recording material composition as claimed in claim 7 1, wherein said diallylphthalate-based prepolymer is a prepolymer selected from the group consisting of a diallylorthophthalate prepolymer, a diallylisophthalate prepolymer and a diallylterephthalate prepolymer, or a combination of two or more thereof.

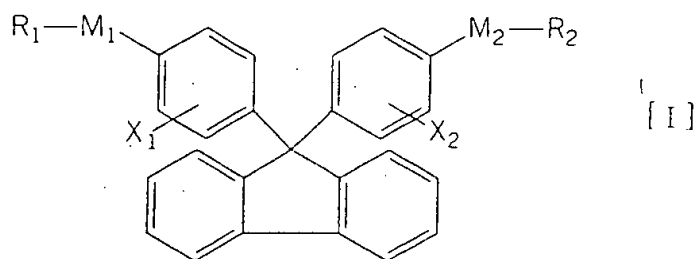
Claim 9 (Original): A hologram recording material composition as claimed in claim 1, wherein said (meth)acrylate-based compound (B) contains from 1 to 6 of polymerizable unsaturated group, and has a molecular weight of 2,000 or less.

Claim 10 (Original): A hologram recording material composition as claimed in claim 1, wherein said (meth)acrylate-based compound (B) contains two of polymerizable unsaturated group.

Claim 11 (Currently amended): ~~A hologram recording material composition as claimed in claim 1, wherein said composition further comprises~~ A non-aqueous solvent-soluble hologram recording material composition consisting of (A) a diallylphthalate-based prepolymer being soluble in a non-aqueous solvent and having at least one allyl group in a molecule thereof and a molecular weight of 10,000 to 100,000, (B) a (meth)acrylate-based compound having at least one polymerizable unsaturated group in a molecule thereof, and (C) a photo-polymerization initiator, wherein a difference between a refractive index of said allyl-based prepolymer (A) and a refractive index of a polymer of said (meth)acrylate compound (B) is 0.005 or more, and a viscosity reducing

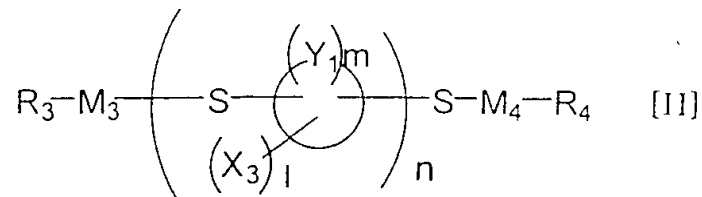
agent (E);

and said (meth)acrylate-based compound (B) contains at least one radical polymerizable compound (b1) selected from the group consisting of a fluorene-based compound represented by the general formula [I],

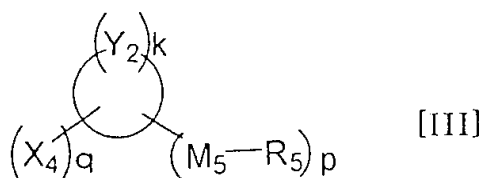


wherein R_1 and R_2 , being the same or different, are monovalent organic groups, at least one of which has a radical polymerizable group at its terminal, M_1 and M_2 , being the same or different, are divalent organic groups represented by $-(OR)_{n1}-$ (wherein R is lower alkylene which can have hydroxyl and/or oxygen, and $n1$ is 0 or an integer of 1 to 5) or single bonds, and X_1 and X_2 , being the same or different, are substituents of the rings and are halogen, hydroxyl or lower alkyl,

a sulfide-based cyclic compound represented by the general formula [II],

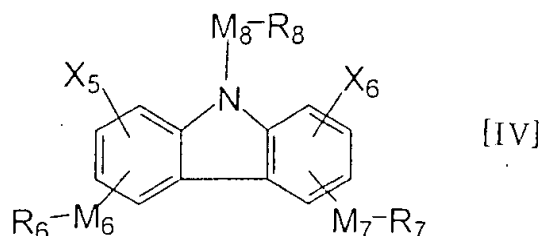


wherein R_3 and R_4 , being the same or different, are monovalent organic groups, at least one of which has a radical polymerizable group at its terminal, M_3 and M_4 , being the same or different, are divalent organic groups represented by $-(OR)_{n2}-$ (wherein R is lower alkylene which can have hydroxyl and/or oxygen, and $n2$ is 0 or an integer of 1 to 5) or single bonds, X_3 is a substituent of the ring and is halogen, hydroxyl or lower alkyl, "l" is an X_3 number of 0 to 6, Y_1 is a ring member atom constituting the ring, all of the atoms $(Y_1)_m$ are carbon atoms, or a portion of them is carbon atom(s) and the rest atoms are heteroatoms, and "m" is a member number of the ring of 5 to 8, a halogenated cyclic compound represented by the general formula [III],



wherein X_4 is a substituent of the ring, at least one of plural $(X_4)_q$ is halogen and others are hydroxyl or lower alkyl, "q" is an integer of 2 to 6, R_5 is a monovalent organic group, at least one of plural $(R_5)_p$ has a radical polymerizable group at its terminal, M_5 is a divalent organic group represented by $-(OR)_{n3}-$ (wherein R is lower alkylene which can have hydroxyl and/or oxygen, and $n3$ is 0 or an integer of 1 to 5) or a single bond, "p" is an integer of 1 to 4, Y_2 is a ring member atom constituting the ring, all of the atoms $(Y_2)_k$ are carbon atoms, or a portion of them is carbon atom(s) and the rest atoms are heteroatoms, and "k" is a member number of the ring of 5 to 8, and

a carbazole-based compound represented by the general formula [IV],



wherein R_6 , R_7 and R_8 , being the same or different, are monovalent organic groups, at least one of which has a radical polymerizable group at its terminal, M_6 , M_7 and M_8 , being the same or different, are divalent organic groups represented by $-(OR)_{n4}-$ (wherein R is lower alkylene which can have hydroxyl and/or oxygen, and $n4$ is 0 or an integer of 1 to 5) or single bonds, and X_5 and X_6 , being the same or different, are substituents of the ring and are halogen, hydroxyl or lower alkyl.

Claim 12 (Original): A hologram recording material composition as claimed in claim 11, wherein a weight ratio of at least one radical polymerizable compound (b1) selected from the group consisting of a fluorene-based compound [I], a sulfide-based cyclic compound [II], a halogenated cyclic compound [III] and a carbazole-based compound [IV] to at least one radical polymerizable compound (b2) selected from the group consisting of the other radical polymerizable compounds than the fluorene-based compound [I], the sulfide-based cyclic compound [II], the halogenated cyclic compound [III] and the carbazole-based compound [IV], (b1) : (b2) is 10 to 100 : 0 to 90 in said (meth)acrylate-based compound (B).

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Claim 13 (Original): A hologram recording material composition as claimed in claim 2, wherein said solvent-soluble thermoplastic resin (D) has a refractive index of 1.300 to 1.800.

Claim 14 (Original): A hologram recording material composition as claimed in claim 2, wherein said solvent-soluble thermoplastic resin (D) is one or a combination of two or more selected from the group consisting of a condensation polymerization product of a diphenol compound and a dicarboxylic acid compound, a resin having a carbonate group in a molecule thereof, a resin having an $-SO_2-$ group in a molecule thereof, polyvinylidene chloride, and a homopolymer or copolymer obtained by polymerizing at least one monomer having an ethylenic unsaturated double bond.

Claim 15 (Original): A hologram recording material composition as claimed in claim 11, wherein said viscosity reducing agent (E) is a compound (e1) which is nonreactive on said allyl-based prepolymer (A) and said (meth)acrylate-based compound (B) or a compound (e2) having allyl or methallyl in a molecule thereof.

Claim 16 (Currently amended): A hologram recording medium comprising a substrate having formed thereon a recording layer comprising a hologram recording material composition claimed in claim 1 or 17.

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Claim 17 (Original): A non-aqueous solvent-based hologram recording material composition comprising (A) an allyl-based prepolymer having at least one allyl group in a molecule thereof and a molecular weight of 10,000 to 100,000, (B) a (meth)acrylate-based compound having at least one polymerizable unsaturated group in a molecule thereof, (C) a photo-polymerization initiator, and a non-aqueous solvent, wherein a difference between a refractive index of said allyl-based prepolymer (A) and a refractive index of a polymer of said (meth)acrylate compound (B) is 0.005 or more.

Claim 18 (New): A method of recording a hologram comprising using the recording medium claims in claim 16.

Claim 19 (New): A method of recording a hologram comprising irradiating the recording medium claimed in claim 16 with two laser lights which are in coherence to record an interference fringe to be a hologram.

Claim 20 (New): A method of copying a hologram comprising superposing an original image - recorded hologram plate on the recording medium claimed in claim 16, and irradiating the hologram plate with light.